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Abstract:

Advanced online product presentation technologies such as virtual mirrors enable consumers to experience products like they are actually with them in the real world. Remarkably, the functional mechanism underlying this phenomenon has not been addressed in previous research. To fill this research gap this paper proposes and empirically validates *local presence* as functional mechanism next to interactivity and vividness. An empirical study was conducted to address the effectiveness of the virtual mirror versus pictures and 360-spin rotation in creating perceptions of local presence, interactivity and vividness. As a second goal, the influence of local presence, interactivity and vividness on perceptions of product tangibility and product likability, two key facets of the online product experience, were assessed. The results show the superiority of the virtual mirror in creating local presence, interactivity and vividness and demonstrate that local presence is both in absolute and relative terms highly predictive of product tangibility and product likability. Theoretical and managerial implications are discussed.

Keywords: online product presentation, local presence, interactivity, vividness, product tangibility, product likability, virtual mirror.

Introduction

Research has highlighted the importance of technology in providing a convincing product experience in online shopping situations. Different product presentation elements, such as high and low quality pictures (Jeong, Fiore, Niehm and Lorenz, 2009), product rotation applications (Park, Lennon and Stoel, 2005), and online product trial (Jiang and Benbasat, 2007a), have been demonstrated to influence consumers' product understanding (Jiang and Benbasat, 2007a), risk perceptions, moods, purchase intentions (Park Lennon and Stoel, 2005), and website patronage intentions (Jeong et al., 2009). The rise and widespread adoption of product presentation technologies have also encouraged researchers to study the mechanisms underlying these influences. Several researchers (e.g., Coyle and Thorson, 2002; Jiang and Benbasat, 2007b; Fiore, Kim and Lee, 2005) identified *interactivity* and *vividness* as important underlying mechanisms. Interactivity refers to "the extent to which users can participate in modifying the form or content of a mediated environment in real time" (Steuer 1992, p. 84), whereas vividness equals "the representational richness of a mediated environment as defined by its formal features, that is, the way in which an environment presents information to the senses" (Steuer 1992, p. 81). Empirical research confirms that product presentation formats that are deemed interactive and vivid increase consumers' understanding of products and positively influence their attitudes towards products and websites (Coyle and Thorson, 2002; Jiang and Benbasat, 2003; Jiang and Benbasat, 2007b). These findings are of high relevance for online retailers not only because they add to their understanding of why and how different product presentations affect the behavior of their visitors, but also because of advances in product presentation technologies that become available in an ever increasing pace (e.g. virtual mirrors, virtual fitting rooms). Since the Internet does not allow consumers to touch, feel and try products as they could in a brick-and-

mortar store, developing insight into the mechanisms underlying these online product presentation formats is vital and openly demanded for (Jiang and Benbasat, 2007b).

Despite the progress made in the research field, recent advances in online product presentation technologies suggest that the existing classification of interactivity and vividness may no longer be sufficient to fully capture reality. In particular, we refer to the rise of a category of new online product presentation formats that attempts to visually break down the barrier between the product and the consumer. These technologies stand out because they do not only present products in an interactive and vivid manner, but also provide the consumer with the illusion that the product is actually present in the real world. Virtual fitting rooms, for example, enable consumers to see how clothing looks by letting them customize a virtual mannequin to their own body sizes and shapes (adidas.com). More technologically advanced examples include augmented reality applications such as virtual mirrors and product visualization apps. On the website of eyewear brand Ray-Ban visitors can make use of a virtual mirror to see what glasses look like on their own face in real time, with the use of their webcam (ray-ban.com). Comparably, though more focused on the consumption setting, by using an app on their smartphone or tablet consumers can visualize how furniture looks into their home before making buying decisions (thefurnishapp.com). What these emerging product presentation formats have in common is that they give consumers a product experience as if the product is "there" with them; as if it is locally present. As such, they closely resemble a direct, unmediated interaction with a product. This sense of the product "being there" with the consumer seems to go above and beyond perceptions of vividness and interactivity, and calls for the conceptualization of a third mechanism underlying online product presentation formats. In this paper we introduce and label this mechanism as *local presence*.

The main goal of the present study is to introduce local presence as the third explanatory mechanism underlying the effects of online product presentation, next to interactivity and vividness. We aim to conceptualize local presence and test its predictive validity in terms of the consumer's online product experience. To study this predictive power two key facets of the online product experience are adopted: product tangibility and product likability. The decision to include these two facets is supported by previous literature (e.g. Chowdury, Olson and Pracejus, 2011; Jiang and Benbasat, 2007) claiming that product experiences consist of cognitive (product tangibility) and affective reactions (product likability). Furthermore, enhancing the perceived tangibility of products and adding positive emotions to online shopping experiences seems to tap directly into one of the major challenges that online retailers face to overcome; the disadvantages of the computer-mediated and distant communication via the Internet. Thus, the inclusion of product tangibility and product likability also adds to the external validity of our study.

The intended contributions of this study are threefold. First, and this should be seen as a conceptual contribution, we extend the classification of two functional mechanisms for online product presentation by introducing and testing the concept of local presence. By assessing the explanatory power of local presence in terms of online product experience, in relation to the two established mechanisms interactivity and vividness, we aim to add to the literature on online product experiences. Second, this study compares the effectiveness of pictures and 360-spin rotation as rather established product presentation formats versus the relatively new and emerging product presentation format *virtual mirror*, in generating local presence, interactivity and vividness. Pictures and 360-spin applications are prominently available in online retail settings making an examination worthwhile. Virtual mirrors are an upcoming format and increasingly are adopted by large online industries such as fashion, jewelry, clothing, shoes, and cosmetics, which make their examination of particular interest.

We are amongst the first to assess the value of virtual mirrors in creating online product experiences, which can be classified as a contextual extension. Third, the derived insights of our study aim to serve online retailers in improving the consumer experience of their products. Understanding will be generated about the relative importance of the three mechanisms for online product presentation in making products to be experienced as more tangible and likable. Also, knowledge will be gained about the potential of three product presentation formats (pictures, 360-spin, virtual mirror) in driving these three mechanisms. The combined insights will assist online retailers in understanding and deciding on the use of the online product presentation formats under study.

The remainder of this paper is organized as follows. In the next section, we provide a conceptual background for our study and introduce the local presence concept. We then proceed by developing our research model and introducing the hypotheses. In the subsequent section we describe the methodology used to test the research model and present the empirical results of the study. The paper concludes with a discussion of the implications of our findings and suggests avenues for future research.

Conceptual background

Online product experience

Consumers' experiences with products can vary on a continuum ranging from direct to indirect (Fazio and Zanna 1981; Mooy and Robben 2002). Seeing a product in an advertisement is less direct than actual product trial, and viewing a product video on a website is more direct than reading a product description online. General consensus in marketing research is that direct experience is superior to indirect experience (Hamilton and Thompson, 2007). Empirical research consistently supports this notion: Product trials produce higher levels of message acceptance and more consistency between consumers' attitudes and

subsequent behavior than exposure to advertising messages (Smith and Swinyard, 1982; 1983) or verbal descriptions of products (Fazio and Zanna, 1978; Fazio, Zanna and Cooper, 1978; Fazio and Zanna, 1981).

In the context of online shopping, indirect experiences are usually the only product experience consumers can rely on before making actual purchase decisions. Convincingly communicating all the qualities of physical products in an online environment is therefore as important as it is challenging. To meet this challenge, online retailers continuously apply more advanced product presentation formats. Compared to the static picture and plain text formats that were dominant during the early years of online retailing, newer product presentation formats, such as video formats and virtual mirrors, are designed to provide more and higher quality product information (Raney, Arpan, Pashupati and Brill, 2003). Higher quantity (Then and DeLong, 1999) as well as quality (Park et al., 2005) of online product information is associated with making it easier for consumers to understand the products and to make more informed buying decisions.

The developments in product presentation formats have sparked scientific interest, and many researchers have tested the effects of different product presentation formats on online consumer behavior (e.g. Jiang and Benbasat, 2007a and b; Li, Dougherty and Biocca. 2001; Lightner and Eastman 2002; Park, Stoel and Lennon, 2008; Smith, Johnston and Howard, 2012). These studies have also zoomed in on the mechanisms underlying how product presentation formats influence consumer behavior. The following section will provide an overview of this research.

Functional mechanisms of online product presentation

Coyle and Thorson (2002) as well as Jiang and Benbasat (2007b) proposed models that predict through which mechanisms online product presentation formats influence consumers'

attitudes and behaviors. Based on the work of Steuer (1992) both sets of authors identified two mechanisms: interactivity and vividness. These concepts refer to two independent and distinct facets of online product experience, namely the way in which consumers interact with products and the sensory quality of the product information that is offered to consumers. Empirical results support the significance of both mechanisms. For example, Coyle and Thorson (2002) found that increases in vividness of product presentation were associated with more positive and more enduring attitudes toward the web site, while Yoo, Lee and Park (2010) concluded that perceptions of interactivity increased perceived consumption value and over all customer satisfaction. Jiang and Benbasat (2007b) showed that perceptions of interactivity and vividness positively affected attitudes toward the product and the website, and increased intentions to purchase and intentions to return to the website.

Still, given the possibilities that emerging applications such as virtual fitting rooms, virtual mirrors, and product visualization apps provide to experience products online, we believe the existing research on vividness and interactivity demands extension. These emerging applications seem to introduce a different mechanism compared to more traditional online product presentation formats. Following the goals of this research we label this mechanism *local presence.*

Local presence

The concept of presence is relevant to different scientific domains, but it is most notably used in the context of virtual reality. In virtual reality literature, presence refers to the situation in which a person experiences a sense of "being there" in a mediated, virtual environment (Spagnolli, Lombard and Gamberini, 2009; Steuer, 1992). For example, when one watches a movie or plays a video game, one may feel as if one exists in the virtual space that is presented there. The extent to which a virtual environment is able to evoke feelings of

presence depends on the degree to which it succeeds in creating conditions that allow users to perceive themselves, other people and objects as physically present in a "real" environment (Mantovani and Riva, 1999).

Conceptually, presence is a work in progress and there are a few different definitions in circulation. The International Society of Presence Research defines presence as a ''psychological state in which even though part or all of an individual's current experience is generated by and/or filtered through human-made technology, part or all of the individual's perception fails to accurately acknowledge the role of the technology in the experience'' (ISPR, 2013). Lombard and Ditton (1997, p.132) introduced a shorter version, defining presence as "the perceptual illusion of nonmediation". Literature also distinguishes between different types of presence, among which telepresence, defined as the sense of "being there" (Steuer, 1992; Spagnolli et al., 2009), and social presence, defined as the sense of being together with others (Fulk, Schemitz, and Steinfield 1990; Lee and Nass, 2003), are the most prominent. Empirical studies show that perceptions of presence are important in virtual worlds because they affect the way individuals' respond to the virtual environment. For instance, telepresence has shown to influence individuals' attitudes and behavior in computer-mediated environments (Hoffman and Novak, 1996), while social presence research shows that users' satisfaction or performance largely depends on their perception of social presence (Biocca, Harms and Burgoon, 2003).

How is the concept of presence relevant for online product presentation? The latest online product presentation technologies, such as virtual mirrors, have something in common with virtual worlds; they attempt to blur the boundaries between "here" and "there" and visually blend the mediated world with the physical world. However, the nature of the presence experience in online stores differs from the experience of presence in virtual worlds. Unlike most virtual worlds, online stores generally do not attempt to create an immersive

virtual environment that requires the visitor to experience a sense of "being there". Rather than the consumer "being there" in the shopping environment, online retailers try to create an experience where the product "is there" with the consumer. Technologies such as virtual mirrors allow consumers to inspect and try a product as if it were physically present with them. This experience is what we label *local presence*. We define local presence as the perception of content in a mediated-environment as being with the user in the real world. Content is a rather broad term, reflecting the features, functions, information and products offered in an online environment (Verhagen, Boter and Adelaar, 2010). Within the current inquiry, content mirrors the products offered on a website, who may be displayed via various formats (e.g. pictures, 360-spin, virtual mirror). Especially for products creating local presence seems of high relevance, as it could be a way to overcome the problems inherently associated with their presentation in mediated online environments. Consumers might consider products that are presented in a manner that elicits perceptions of local presence more "real", resulting in a better product experience. The experience of local presence goes above and beyond perceptions of vividness and interactivity. A product may be presented in a way that is highly interactive (e.g. 360-spin) or vivid (e.g. video), but this does not necessarily evoke perceptions of the product being locally present, that is, in the same physical space as the consumer.

Model construction and development of hypotheses

Figure 1 shows our conceptual model. The functional mechanisms of online product presentation constitute the heart of the model and extend the previously established mechanisms interactivity (Fiore et al., 2005; Coyle and Thorson, 2002; Jiang and Benbasat,

2007) and vividness (Coyle and Thorson, 2002; Jiang and Benbasat, 2007) by adding local presence as third mechanism. The product presentation formats pictures, 360-spin and virtual mirror are modelled as drivers of the functional mechanisms.

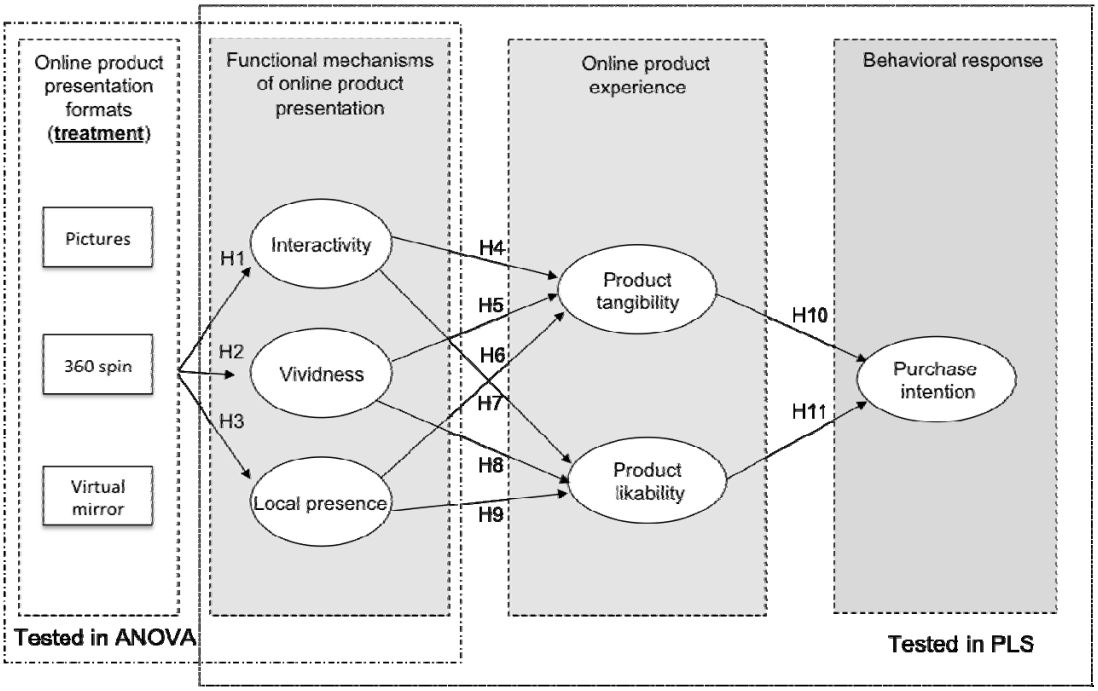

Figure 1: Conceptual model

To assess the predictive influence of local presence in determining online product experiences, and to compare this influence versus the influence of interactivity and vividness, the functional mechanisms of online product presentation are modelled as determinants of product tangibility and product likability. Our decision to include product tangibility and product likability as key facets of online product experience was based upon numerous studies into how consumers process product presentation (e.g., Chowdury et al., 2011; Jiang and Benbasat, 2005 and 2007; Parboteeah, Valacich and Wells, 2009), and grounded in theoretical paradigms such as the Stimulus-Organism-Response framework (Mehrabian and Russell, 1974), the Cognitive-Experiential Self-Theory (Epstein, 1993) and the independence hypothesis (Zajonc, 1980; Zajonc and Markus, 1982); all suggesting that product

presentations may trigger both cognitive and affective product reactions. Product tangibility refers to the extent to which a product is accessible to the senses, has precisely identifiable definitions, features and outcomes, and is easy to grasp mentally (Laroche, Bergerond and Goutaland, 2001; Laroche, Yang, McDougall and Bergeron, 2005). Product tangibility is dominantly cognitive in nature. Product likability on the other hand, is principally affective in nature and can be defined as the extent to which a product has the potential to elicit a positive emotional response in the average consumer (cf. Chaudhuri and Holbrook, 2001, p. 82). Finally, adding to the managerial relevance of our research, purchase intentions complete the model. In the below we will elaborate on all research constructs and their proposed interrelationships.

Influence of product presentation formats on vividness, interactivity and local presence

Prior research argued and showed that different product presentation formats elicit different levels of interactivity. Jiang and Benbasat (2007b) compared pictures, video, and an online product simulator, which allowed participants to virtually use various functions of a sports watch and a Palm Pilot PDA. They argued that the online product simulator would require consumers to be actively involved in inspecting a product and provide them with direct feedback about the product, thus making them more interactive than pictures or video. In line with this argument and based on the fact that virtual mirrors approximate product experiences in offline settings by providing high quality product information through interaction, we expect the effects of more technologically advanced, web cam based virtual mirrors to be perceived as more interactive compared to more traditional product presentation formats. We therefore propose that:

H1: Virtual mirrors will be perceived as more interactive compared to pictures and 360-spin rotation.

Based on the work of Jiang and Benbasat (2007b) we also expect the three product presentation formats included in the present study to differ in levels of vividness. Virtual mirrors provide consumers with both temporal visual changes and sound effects when inspecting a product. In comparison, 360-spin formats offer temporal visual changes, but no sound effects, while pictures only provide static visual input. Because of this difference in sensory stimulation virtual mirrors are expected to be perceived as most vivid, followed by the 360-spin format. Static images are expected to elicit the lowest level of vividness.

H2: Virtual mirrors will be perceived as more vivid compared to pictures and 360-spin rotation.

The current study extends the models of Jiang and Benbasat (2007a; 2007b) and Coyle and Thorson (2002) by introducing local presence as a third mechanism underlying the effects of online product presentation. Unlike the more traditional presentation formats included in this study (pictures and 360-spin rotation), virtual mirrors are specifically designed to provide the illusion that there is no physical barrier between product and the consumer. We therefore only expect participants to feel as if a product is there with them when they inspect it using a virtual mirror. Based on these assumptions, we propose the following hypothesis:

H3: *Virtual mirrors will elicit a higher perception of "local presence" compared to pictures and 360-spin rotation.*

Influence of interactivity, vividness, and local presence on product tangibility

Perceptions of product tangibility are likely to be affected by product presentation formats. Interactive product presentation formats provide consumers with relevant cues about the functionality of the product. Furthermore, interactive product presentation formats allow consumers to actively investigate the product and its features at their own pace. Such information is vital for consumers to form a clear mental representation of the product and its uses (Schlosser, 2003; Moore, Burton and Myers, 1996), which, in turn, is needed for making pre-purchase decisions (Coyle and Thorson, 2001; Laroche et al., 2005). We therefore assume that:

H4: Increased interactivity will increase perceptions of product tangibility

Vividness can also be associated with increased perceptions of tangibility. Because vivid information captures attention, it is more likely to engage people in cognitive elaboration about the product and its features (Nisbett and Ross, 1980). Furthermore, vivid product presentations present consumers with more and richer sensory cues about the product (Jiang and Benbasat, 2005), which make vivid product presentation come closer to the physical shopping experience (Jiang and Benbasat, 2007b) compared to more pallid product presentation. This will make it easier for consumers to construct a good understanding of the product they are inspecting. Thus, we hypothesize:

H5: Increased vividness will increase perceptions of product tangibility

According to Biocca and Delaney (1995) presence occurs when the user of a medium perceives an illusion that stimulates sensory experiences. In a consumer context this is the illusion that a product is locally present with the consumer in the real environment (Lee, 2004; Biocca and Delaney, 1995). This illusion allows consumers to inspect and evaluate online products in a more direct and natural way, which reduces cognitive effort (Kock, 2002; 2005), facilitates learning processes and increases comprehension of the product (Klein, 2003; Li et al., 2003). We therefore expect that products will be perceived as tangible physical objects when presented in a way that is more locally present.

H6: Increased local presence will increase perceptions of product tangibility

Influence of interactivity, vividness, and local presence on product likability

During a shopping experience, affective responses toward the product are formed based on the interaction with the product. The more consumers like the product they are inspecting, the more likely they are to consider buying this product (Jarvenpaa and Todd, 1997; Nowlis and McCabe, 2000). We expect that perceptions of vividness, interactivity, as well as local presence will impact whether or not a consumer likes a product.

Researchers have found support for relationships between interactivity and positive emotions in the context of websites (Ariely, 2000; Koufaris, 2002; Jones, Spence and Vallaster, 2008). In interactive online environments users are in control of their environment; they can provide input and determine the pace of the information they receive and send. Ellsworth and Scherer (2003) assume that the level of control one has during an event significantly influences ones emotional response to this event. High control can lead to positive emotions in positive events, and to negative emotions in negative events, whereas a lack of control often causes frustration (Ellsworth and Scherer, 2003). As online shopping can

generally be regarded as a positive event (Childers, Carr, Peck, and Carson 2001; Menon and Khan, 2002; Ha and Lennon, 2010) we can assume that perceptions of interactivity experienced during product inspection will induce positive emotional responses to that product.

H7: Increased interactivity will increase product likability

In case of a vivid product presentation, rich information is presented and many sensory channels are stimulated. It is therefore not surprising that vivid information is generally regarded as exciting to the extent that it is emotionally interesting, concrete and imagery provoking (Nisbett and Ross, 1980). Vividness is generally linked to positive emotional reactions. For instance, Miller and Marks (1997) have empirically proven that vividly presented instruction messages increased positive affective responses to this message. In the context of online shopping, Jiang and Benbasat (2007b) found that vivid online product presentation increases enjoyment of the shopping experience for consumers. Based on this research, we argue that products that are presented in a way that is perceived as more vivid will elicit positive affective responses and will be considered more likable.

H8: Increased vividness will increase product likability

Prior presence research has also linked perceptions of presence to positive emotional responses. A study in the context of virtual reality (Riva et al., 2007) confirmed the efficacy of virtual reality as an affect-inducing medium. The study showed that differently designed virtual reality environments were able to induce specific emotions in users. Furthermore, Lessiter et al. (2001) studied presence among different movie formats (e.g. a black-and-white film with no subtitles versus an IMAX-3D movie). They found that the more realistic movie

medium led to more engagement, which was conceptualized as involvement, interest and general enjoyment of the displayed environment. It is therefore plausible that, in the context of the present study, perceptions of local presence will elicit favorable affective responses toward the product.

H9: Increased local presence will increase product likability

Influence of cognitive and affective responses on purchase intentions

The consumer response system involves cognition, affect, and, subsequently, behavior (Hirschman and Holbrook, 1982). Instead of actual behavior, behavioral intention, such as an intention to purchase, is often used to assess marketing effectiveness (Hoch and Ha, 1986). There is ample empirical proof for the assumption that positive cognitive and affective responses to a retail environment or product will increase purchase intentions (e.g. Shiv and Fedorikhin, 1999; Verhagen and Van Dolen, 2011). Based on such research we expect that, in the present study, consumers who have more positive cognitive and affective responses toward a product will be more inclined to purchase this product. We therefore formulate the following hypotheses:

H10: Increased perceptions of product tangibility will increase purchase intention

H11: Increased product likability will increase purchase intention

Method

To test our hypotheses data were collected through a laboratory experiment. The goal of the experiment was to create an environment that inspired participants to envision themselves an online purchase setting.

Experimental Task

The decision task was to select a pair of sunglasses that participants would consider purchasing. In the introduction of the task it was emphasized that it is important to imagine yourself a consumer looking for a pair of new sunglasses online. To do so the participants were introduced to one of the three product presentation formats available to view glasses on the web shop of Ray-Ban (www.Ray-Ban.com): digital pictures, 360-spin rotation, and Virtual Mirror (Ray-Ban virtual mirror).

Treatments

The existing Ray-Ban web shop was used to fulfill the decision task. The actual web shop could be used because, apart from the product presentation formats, the lay out and functionality of the website remained constant for all three conditions.

To control for confound effects due to different choice sets, we selected the common denominator of sunglasses available in all three presentation formats. From this set, based on rigorous pre-testing, ten pairs of glasses were selected; five models suited for women and five models suited for men. All male participants were shown the same five pairs of glasses pre-selected for males, and all female participants were exposed to the five models pre-selected for women. To avoid price-based preferences, the sunglasses were all the same price. Prior to every session of the experiment the supervisors made sure that the relevant set of five sunglasses was ready to be selected in a web browser. Five browser tabs were used to present

the sunglasses to the participants. Depending on the condition assigned to, the tabs confronted the participants with the sunglasses in either the picture, 360-spin rotation or virtual mirror format. Using tabs not only facilitated easy browsing between the sunglasses but also prevented that participants would browse freely through the web shop and have any kind of interaction with the sunglasses in a presentation format not assigned to.

In the pictures condition, participants could inspect the glasses by looking at pictures of the different models. They could not zoom in on the images. The 360-spin condition allowed participants to virtually rotate images of the different glasses with the use of their mouse. In the virtual mirror conditions participants could virtually try the different glasses. In this condition a webcam and the virtual mirror application were used to recognize the participant's facial features in the webcam footage. The application visually superimposed images of a selected pair of glasses over the webcam image of the participant's face. As such participants could see what the glasses looked like on their own face in real time. The application even allowed them to move their head to inspect the glasses from various angles. Configuration of this application was a seamless process, guided by instructions given by the application. None of the participants reported problems in this configuration process.

Experimental Procedures

Upon entering the lab setting, participants were randomly assigned to one of the three conditions and received instructions about the shopping task from the instructors. To avoid differences across sessions, the same instructors supervised all the sessions, operating according to a strict script. The supervisors informed the participants about the general procedures. The participants were asked to inspect the choice set prepared for them in the five tabs of the web browser and choose their favorite pair of sunglasses accordingly.

The experimental task was executed on a computer situated in an individual cubicle. During the sessions the instructors were available to answer questions and when needed help participants in a way that did not intervene with the objectives of the experiments. Participants were told to raise their hand when they decided which pair of sunglasses to choose. The instructors then recorded the model of choice for each participant and set up the online post-experiment questionnaire. After participants filled out the online questionnaire they were debriefed and thanked for their participation.

Participants

Participants were undergraduate and graduate students from a mid-sized university in The Netherlands, and were recruited at the university's study facilities. Participation was voluntary. To enhance involvement and make sure that decision makers took the experimental online shopping task seriously, participants could win the pair of sunglasses selected in the decision task. A pair of Ray-Ban sunglasses was raffled among the participants. A total of 366 participants successfully completed the experimental task.

Table 1: Participant characteristics and descriptive measures (*N* = 366).

	% of respondents (*n*)			% of respondents (*n*)	
Age			Last time participant bought sunglasses		
15-19	20.2%	(*74*)	Never	4.1%	(*15*)
20-24	59.8%	(*219*)	Last year	54.1%	(*198*)
25-29	16.4%	(*60*)	Last three months	18.9%	(*69*)
30-34	1.6%	(*6*)	Last month	18.0%	(*66*)
>35	1.9%%	(*7*)	Last week	4.9%	(*18*)
Gender			Familiarity with Ray-Ban brand		
Male	48.8%	(*178*)	Yes	92.6%	(*339*)
Female	51.4%	(*188*)	No	7.4%	(*27*)
Experience with Internet*			In possession of Ray-Ban sunglasses		
Very inexperienced	0.0%	(*0)*	Yes	33.9%	(*124*)
Inexperienced	0.0%	(*0)*	No	66.1%	(*242*)
Neutral	16.1%	(*59*)			
Experienced	50.3%	(*184*)			
Very experienced	33.6%	(*123*)			
Experience with online shopping*			Frequency of visiting Ray-Ban website		
Very inexperienced	2.2%	(*8*)	Never	63.7%	(*233*)
Inexperienced	11.5%	(*42*)	Once a year	28.1%	(*103*)
Neutral	28.7%	(*105*)	Once a month	6.8%	(*25*)
Experienced	38.5%	(*141*)	Once a week	1.4%	(*5*)
Very experienced	19.1%	(*70*)	Every day	0.0%	(*0*)

Note: * self-reported experience.

Pretests

The experimental setup was developed over the course of a number of trials. Preliminary tests were done on the instructions, online survey, and three conditions (pictures, 360-spin rotation, and virtual mirror). The pretests revealed that some phrasing had to be translated differently for better overall understanding. The results of the pretest were mostly as expected. Sunglass styles were also analyzed in order to control for preference. Pretest participants were further interviewed to make sure the five sunglass choices included a pair that students really liked and would thus motivate them to win in a raffle. This extra analysis also controlled for confound effect.

Measures

Seven-point multi-item measures were used to measure the research constructs (Likert scaling, 1 = totally disagree, 7 = totally agree). The selected items were taken from established measurement instruments that have been validated in prior studies. Some of the items were slightly adapted to make them more applicable to the context of our study. All constructs were measured as first-order reflective variables[1]. Table 2 provides an overview of the instruments used and Table 3 shows the average scores across the different experimental conditions.

[1] Following recent insights in latent variable modeling (e.g., Fin and Wang, 2013; Lee and Cardogan, 2012) the higher-order reflective measurement instrument of product tangibility of Laroche et al. (2001) was transformed into a first-order reflective measurement model. Such transformation avoids redundancy in measurement and prevents ambiguity in mapping back empirical results to the conceptual variables (see Lee and Cardogan, 2013).

Table 2: Convergent validity and reliability statistics ($N = 366$)

Construct	Items	Cronbach's alpha	Composite Reliability	AVE
Interactivity (I) (Jiang and Benbasat, 2007b)	I1: I am able to interact with this product I2: The product can respond to my input on this Web interface	.88	.94	.89
Vividness (V) (Jiang and Benbasat, 2007b)	V1: The product on this website is animated V2: The product on this website is lively V3: I can acquire product information on this website from different sensory channels V4: This website contains product information exciting to the senses	.89	.92	.75
Local Presence (LP) (Juan and Joele, 2011; Slater et al., 1994; Klein, 2003).	LP1: The experience I had on this website was similar to memories of experiencing sunglasses in reality LP2: I experienced the sunglasses on the website like they were in the real world LP3: During my experience on the website the product seemed to me "something in reality" rather than "something in a virtual environment" LP4: While I was on the website the products were as present to me as in the "real world"	.93	.95	.83
Product Likeability (PL) (Beatty and Ferrell, 1998; Laros and Steenkamp, 2005).	PL1: I felt excited about the sunglasses PL2: I felt enthusiasm toward the sunglasses PL3: I felt proud toward the sunglasses PL4: I felt inspired toward the sunglasses	.90	.94	.79
Product Tangibility (PT) (Laroche et al., 2005)	PT1: It seemed like I could touch the sunglasses PT2: It seemed like I could grasp the sunglasses PT3: It seemed like the sunglasses were physically tangible PT4: I have enough information about the sunglasses to get a good idea of what they are PT5: It is easy to think about the sunglasses on the website PT6: It is clear to picture the sunglasses PT7:It is easy to describe many characteristics of the sunglasses on the website PT8: I can easily explain the characteristics of the sunglasses on this website PT9: I is not difficult to give a precise description of the	.93	.94	.64

	sunglasses on this website			
Purchase Intention (PI) (Verhagen and Van Dolen, 2009)	PI1: It is likely that I will soon buy sunglasses via this web site. PI2: It is likely that I will purchase sunglasses from this website in the future. PI3: It is likely that I will return to this website	.83	.90	.74

Table 3: Descriptives (N = 366)

	Total (N = 366)	**Pictures (N = 122)**	**360-spin (N = 122)**	**Virtual Mirror (N = 122)**
Interactivity	4.58 (1.75)	2.97 (1.47)	4.90 (1.33)	5.88 (0.96)
Vividness	4.48 (1.45)	3.40 (1.25)	4.39 (1.22)	5.64 (0.87)
Local presence	3.76 (1.65)	2.99 (1.43)	3.55 (1.40)	4.74 (1.60)
Product Likability	4.27 (1.46)	3.59 (1.47)	4.50 (1.30)	4.72 (1.35)
Product Tangibility	4.50 (1.31)	3.72 (1.25)	4.37 (1.07)	5.41 (0.99)
Purchase Intention	3.98 (1.41)	3.39 (1.42)	3.93 (1.35)	4.63 (1.17)

Note: Standard deviations are shown in parentheses

Data analysis and results

Measurement reliability and validity

The data were analyzed using analysis of variance (ANOVA) and Partial Least Squares (PLS) modeling. ANOVA was conducted using IBM SPSS statistics to assess the effects of the experimental conditions (the three product presentation formats) on the three proposed functional mechanisms of online product presentation: vividness, interactivity and local presence. We chose PLS modeling to test the remainder of the conceptual model, as this type of analysis is most suitable when the research has exploratory characteristics, is mainly predictive, and is applied in a field where theoretical knowledge is limited (Ringle, Sarstedt and Straub, 2012). Also in more confirmatory situations, where researchers draw upon an established base model and extend it by adding a construct to see how it performs in terms of predictive validity and relative importance, PLS is well suited (Chin, 2010). Given that the

present study is the first to introduce the concept of local presence as online product presentation mechanism, and test its predictive validity in relation to two more established mechanisms (i.e. interactivity; vividness) in the context of a rather unexplored new product presentation format (virtual mirror), PLS seemed the most appropriate choice here.

The software SmartPLS (Ringle, Wende and Will, 2005) was used to test the adequacy of the measurement model. We investigated the convergent validity, and assessed measurement reliability by computation of Cronbach's alphas, composite reliabilities and Average Variance Extracted (AVE) (see Table 2). The results confirmed the convergent validity of the measures. All scores exceeded accepted criteria (factor loadings: 0.70; alphas: 0.80; AVEs: 0.50). As all composite reliability scores exceeded 0.70, and all AVEs surpassed the 0.50 guideline, acceptable reliability of the measures also was demonstrated. We then tested for discriminant validity by comparing the Average Variance Extracted (AVE) of each construct with its squared correlations with other constructs (Table 4). As none of the squared correlations between two constructs exceeded the AVE of each of these constructs, the results confirmed discriminant validity.

Table 4: Discriminant validity: AVE's versus squared cross construct correlations (N = 366)

	Interactivity	Vividness	Local Presence	Tangibility	Likability	Intention
Interactivity	**.90**					
Vividness	.28	**.76**				
Local presence	.29	.27	**.83**			
Tangibility	.41	.44	.53	**.65**		
Likability	.58	.25	.35	.34	**.79**	
Intentions	.25	.36	.23	.30	.26	**.75**

Note: The bold scores on the diagonal are the AVEs of the individual constructs. Off diagonal values are the squared correlations between the constructs.

Hypothesis testing

To test whether different product presentation formats elicited different perceptions of interactivity, vividness, and local presence, three unifactor ANOVA (product presentation format: pictures vs. 360-spin vs. virtual mirror) were conducted in SPSS. A unifactor ANOVA with *interactivity* as the dependent variable showed significant differences between the three product presentation formats ($F(2,363) = 165.51$, $p < .001$, $\eta^2 = .48$). According to post hoc analysis, participants in the 360-spin condition perceived this format as more interactive (M=4.90, SD=1.33) compared to participants in the pictures condition (M=2.97, SD=1.46), and this difference was significant ($p< .001$). Furthermore, participants in the virtual mirror condition perceived their product presentation format as more interactive (M=5.88, SD=0.96), compared to participants in both the picture and the 360-spin condition. These differences were significant ($p< .001$ and $p< .001$ respectively, see Figure 2).

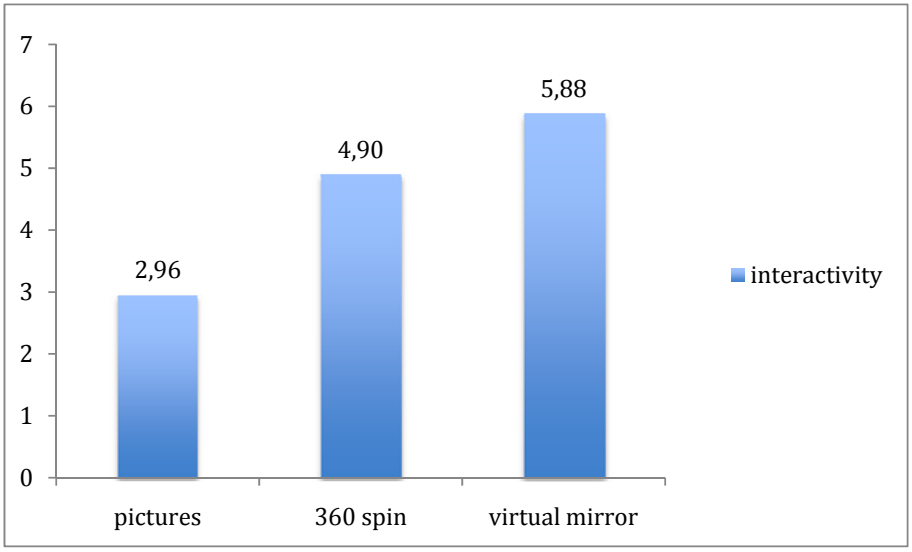

Figure 2: Means for perceived interactivity per condition

A second unifactor ANOVA with *vividness* as the dependent variable showed significant differences between the three product presentation formats ($F(2,363) = 121,58$, $p <$

.001, $\eta^2 = .40$). Post hoc analysis revealed that the 360-spin format (*M*=4.40, *SD*=1.22) was perceived as more vivid compared to the pictures condition (*M*=3.40, *SD*=1.25), and this difference was significant ($p < .001$). Participants in the virtual mirror condition perceived their product presentation format as more vivid (*M*=5.64, *SD*=0.87), compared to participants in both the picture and the 360-spin condition. These differences were also significant ($p < .001$ and $p < .001$ respectively, see Figure 3).

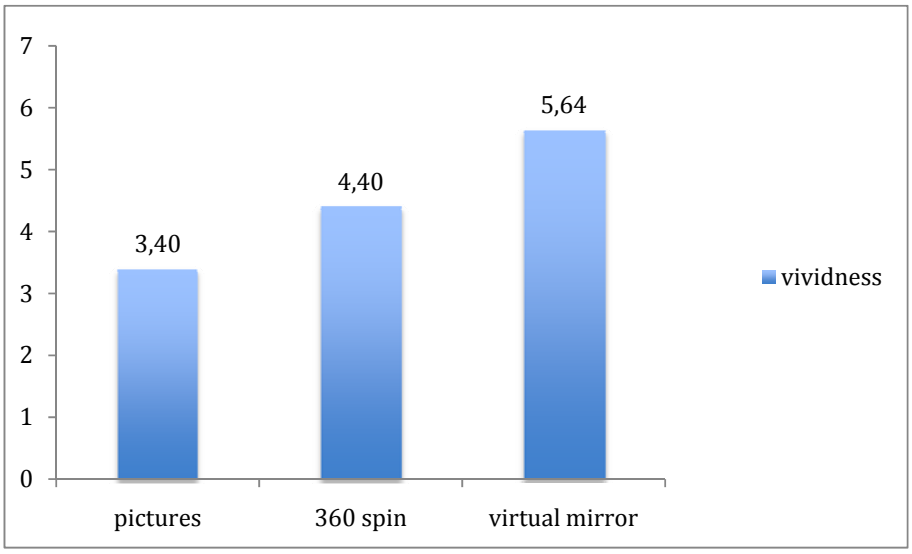

Figure 3: Means for perceived vividness per condition

The last unifactor ANOVA used *local presence* as a dependent variable. This analysis again showed significant differences between the three product presentation formats ($F(2,363) = 44.27$, $p < .001$, $\eta^2 = .20$). Post hoc analysis showed a significant difference between the picture (*M*=2.99, *SD*=1.42) and 360-spin (*M*=3.55, *SD*=1.40) conditions ($p < .05$). Participants in the virtual mirror condition perceived their product presentation format as more locally present (*M*=4.74, *SD*=1.60), compared to participants in both the picture and the 360-spin condition. Both differences were significant ($p < .001$ and $p < .001$ respectively, see Figure 4). These analyses show that the first three hypotheses were accepted.

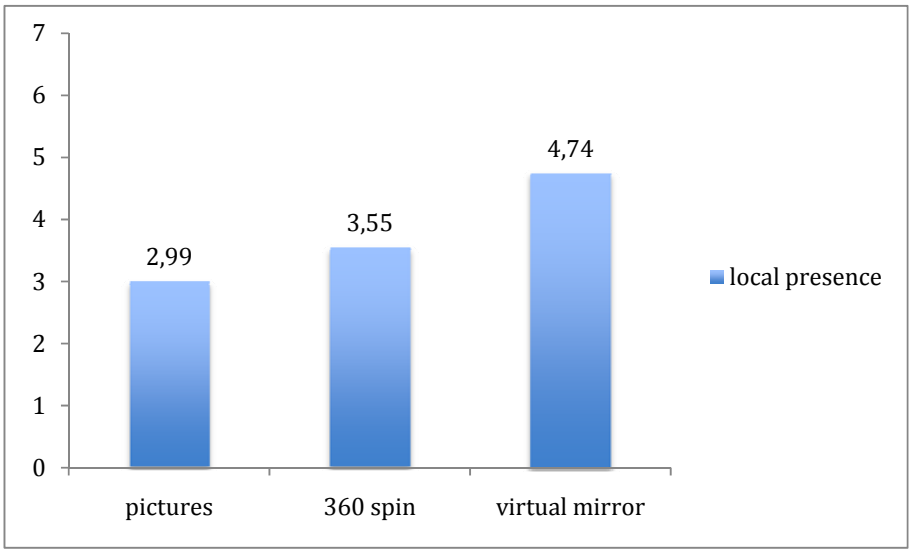

Figure 4: Means for perceived local presence per condition

We then applied PLS modeling (bootstrapping, 500 subsamples) to estimate the remaining of the structural model and test the hypotheses four through eleven. The path coefficients (ß) and R^2 values of the structural model are shown in Table 5 and Figure 5. The structural model showed that all of hypotheses four through eleven were accepted. As predicted, higher levels of vividness, interactivity and local presence increased participants' beliefs about product tangibility. An impressive 64% of the variance in product tangibility was explained by these factors. Furthermore, the more vivid, interactive, and locally present the presentation format was perceived, the more participants liked the product. Together, these factors accounted for 33% of the variance in product likability. Product tangibility and likability, in turn, positively affected participants' purchase intentions for the product. Together, these factors explained 41% of the purchase intention variance.

Table 5 Hypothesis testing results of PLS modeling (N=366)

Hypothesis	**Path**	**ß**	**Sign.**
H4	Interactivity → Product tangibility	0.20	<.001
H5	Vividness → Product tangibility	0.20	<.001
H6	Local presence → Product tangibility	0.52	<.001
H7	Interactivity → Product likability	0.23	<.001
H8	Vividness → Product likability	0.18	<.01
H9	Local presence → Product likability	0.26	<.001
H10	Product tangibility → Purchase intention	0.30	<.001
H11	Product likability → Purchase intention	0.42	<.001

Note: All expected relations were positive

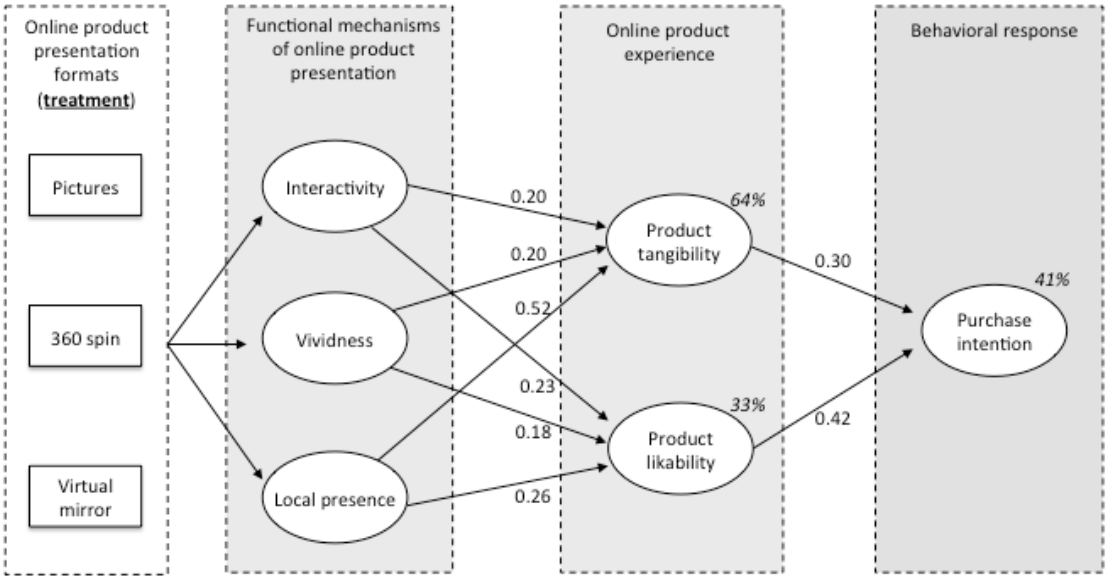

Figure 5: Results structural model: beta values and explained variance

Discussion and conclusion

Summary and key findings

This research introduced local presence as online product presentation mechanism next to the established mechanisms interactivity and vividness. We assessed to what extent different product presentation formats (pictures, 360-spin applications, and virtual mirrors) stimulate perceptions of local presence. To estimate the predictive validity of the local presence concept we tested its influence on product tangibility and product likability as facets

of the online product experience, and thereof online purchase intentions. To determine the relative importance of local presence, interactivity and vividness were tested as determinants of product tangibility and product likability as well. The empirical analyses yield three interesting key findings.

First, the present study shows that virtual mirrors are a promising new product presentation format. Only a handful of empirical studies so far have investigated the potential of virtual mirror technology in online retailing (Cho and Schwartz, 2010; 2012; Smith, Johnston and Howard, 2011), but as far as the authors of this paper are aware, none has systematically compared the effects of virtual mirrors with more traditional product presentation formats. Our results affirm that the virtual mirror format makes consumers perceive products presentations significantly more interactive, vivid and locally present compared to the 360-spin and picture format. Although the 360-spin format does outperform the picture format, the virtual mirror seems superior over these two formats both in absolute and relative terms.

Second, the results indicate that product presentation mechanisms are rather strong determinants of consumer online product experiences. Together, interactivity, vividness, and local presence explained a high amount of the variance of product tangibility and a substantial amount of the variance of product likability. At the individual level, all product presentation mechanisms significantly contributed to both product tangibility and product likability. Most important, and this clearly supports the focus of this research, local presence could be labeled as the strongest predictor. Although the differences in explaining product likability were modest, local presence clearly had a stronger influence on product tangibility than interactivity and vividness. Together, these findings underline the relevance of generating feelings of local presence when optimizing online product experiences.

Third and finally, the results of the analysis demonstrate that both product tangibility

and product likability translate into online purchase intentions. This finding not only underlines the relevance of studying online product experiences, it also emphasizes the value of adopting a view on online product experiences which includes facets traditionally associated with the limitations of buying products in online environments (i.e., the tangibility of products and the extent to which these products can be experienced emotionally). The rise of new online product presentation formats that bridge the gap between virtual and real environments seems thus to justify the inclusion of these facets when studying online product experiences and their consequences.

Theoretical implications

This study makes a contribution to the literature on online product presentation mechanisms (e.g., Coyle and Thorson, 2002; Jiang and Benbasat, 2005; 2007a; 2007b) by arguing and validating local presence as third mechanism next to interactivity and vividness. The findings of our study suggest that local presence is a mechanism that may strongly account for how consumers experience products online. By adding tangibility and feelings of likability to the online product experience, local presence may translate into purchase intentions. Given this potential, and acknowledging the rise of new online product presentation formats such as virtual mirrors, local presence seems a viable extension of the established classification of interactivity and vividness.

Another implication of our study is that we validate that the extended classification of online product presentation mechanisms triggers both cognitive and affective product responses. As such, we confirm the logic posited in previous theory (e.g., Stimulus-Organism-Response framework (Mehrabian and Russell, 1974); the Cognitive-Experiential Self-Theory (Epstein, 1993); the independence hypothesis (Zajonc, 1980; Zajonc and Markus, 1982)) and demonstrate its applicability in the context of online product experiences. The use and

validation of product tangibility and product likability as typical cognitive and affective responses supports this notion and also shows researchers the value of combining these two concepts. Product tangibility has been tested mainly in research that adopts a cognitive lens to study online consumer behavior (e.g., Laroche et al., 2001, 2005, 2010). Product likability on the other hand taps into the emotional domain of online consumption. Apparently, integrating both concepts helps us to obtain a fuller picture of the role of cognition and affect in online product experiences and to assess the contributions of the underlying streams of research therein.

Finally, the findings of this study imply that new online product presentation formats may be used to provide consumers with the illusion that the products are actually present in the real world. At the more abstract level, this implication entails that web-based technology enables online retailers to bridge the gap from the online to the offline world. This insight sheds new light on crossing the boundaries between offline and online consumer experiences. The vast body of research has studied this topic by adopting a telepresence view, that is, a study into the options to use web-based technology to transpose part or all of an individual's offline experience to computer mediated environments (cf. Klein, 2003; Mollen and Wilson, 2010). We put the limitation of this view into perspective by demonstrating that web-based technology may also be used with the purpose to present products online to have them experienced as locally present.

Managerial implications

The present study also has implications for online retailing practice. Our results highlight the value of current technological developments for product presentation in online retailing. The fact that virtual mirrors performed significantly better than the more traditional product presentation formats indicates that virtual formats are not just a technological novelty

or gadget, but constitute a valuable addition to the online retailer's product presentation portfolio. By increasing perceptions of interactivity, vividness and local presence, virtual mirrors stimulate favorable consumer responses toward products. Thus the adoption of virtual mirror technologies might be used to stimulate online sales. Furthermore, based on our findings, online retailers would be well advised to try and create feelings of local presence on their website. This might be especially important for retailers who sell physical products that have sensory attributes consumers need to "feel", "try" and "touch" before buying, such as clothing or apparel. The present study shows that products that are presented in a manner that elicits feelings of local presence are considered more tangible and more attractive to consumers, which, in turn, increases purchase intentions. Finally, in the context of this study the effect of local presence on product tangibility and likability is superior compared to interactivity and vividness. In case choices must be made due to budget limitations, online retailers that aim for effective online experiences could give priority to the development of features that enhance feelings of local presence over features stimulating interactivity and vividness.

Limitations and recommendations

Some limitations of the current study need to be addressed. First, we used a student sample. This choice was partly made for sampling convenience, but we also considered students a relevant target group for our study, as they are generally experienced with online shopping. We carefully selected a product that would likely appeal to this specific group of consumers, and confirmed this with a pre-test. However, although students as participants can be considered appropriate given the theory-building goal of this study (Greenberg, 1987) ,this sampling choice means that caution is needed when extrapolating our findings to online

consumers in general.

A second limitation concerns the product that was chosen for this experiment. Sunglasses represent a product category that students are familiar with and attach importance to (Polyorat, Alden and Kim, 2007). Even though this contributes to the internal validity of the experiment, we do recognize that sunglasses of a fashionable brand represent a category of high- involvement products. The question remains to what extent the product presentation formats and the functional mechanisms play a role for low-involvement products. When buying low-involvement products consumers are assumed to rely less on external information (Schmidt and Spreng, 1996), which might downgrade the influences of the formats and mechanisms. We suggest future empirical study to address this issue.

Another issue for further research is the question whether presentation formats that stimulate perceptions of local presence are necessary for every product category, or for every customer. Research indicates that more technologically advanced product presentation formats may not always be more effective. Smith et al. (2011) suggested that the fit between the type of information provided by the technology and the type of information sought by the consumer strongly affects the outcome of online product evaluations. According to their results, virtual presentation formats led to more positive consumer evaluations when consumers were concerned with their self-image, but led to significantly less positive outcomes when consumers were looking for functional information. It is therefore important for future studies to address the influence of consumer needs in the evaluation of product presentation technologies.

Finally, the present study included three different presentation formats that reflect the range of formats that are being used in today's online retailing environments. There are, however, many more product presentation formats in use, and future research could provide insights into the importance of perceptions of vividness, interactivity and local presence for

other formats. Of particular interest would be a group of emerging technologies that may be used as product presentation formats in the near future. 3D images and holographic images, for example, will be introduced and could open up a realm of new possibilities for online retailers to enrich online product experiences and blur the boundaries between online and offline environments.

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